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ECONOMICS OF PLANT PREPARED THROUGH AIR LAYERS OF GUAVA (*PSIDIUM GUAJAVA* L).

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ABSTRACT

The experiment was conducted in the horticulture garden at Bihar Agricultural college, Sabour in year 2009-2010. The design of experiment was Randomized Block Design with three replications. The experiment comprised of twelve treatments including control. The symbol and treatment detail is are as follows;- T_1 – Control, T_2- Etiolation, T_3 – NAA @ 3000 ppm, T_4 – NAA @ 6000 ppm, T_5 – NAA @ 3000 ppm + etiolation, T_6 – IBA @ 3000 ppm, T_7 – IBA @ 6000 ppm, T_8 – IBA @ 3000 ppm + etiolation, T_9 – NAA @ 3000 ppm + IBA @ 3000 ppm, T_{10} – NAA @ 3000 ppm + IBA @ 6000 ppm, T_{11}- NAA @ 6000 ppm + IBA @ 3000 ppm and T_{12} – NAA @ 6000 ppm + IBA @ 6000 ppm. Maximum success (94.66 %) was obtained with etiolation followed by application of IBA @ 3000 ppm concentration, which was statistically at par with T_5 (91.33 %) and T_7 (88.33 %). Whereas, control i.e., T_1 showed 54.33 per cent rooting in air-layers. The best treatment in respect of survivability was T_8 (etiolation + IBA @ 3000 ppm) which showed maximum survival (78.33 %). Next effective treatment was T_5 (etiolation + NAA @ 3000 ppm) with 75.90 per cent survival of air-layers in nursery.

***KEYWORDS:** Etiolation, IBA, NAA, Net Income and B: C Ratio*

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INTRODUCTION

Guava (*Psidium guajava* L.) is the fourth most common and popular fruit of India in area and production after mango, citrus and banana. It is said to be the “apple of tropics” ” (Hayes, 1957). It is good source of Calcium, Iron, fair source of Phosphorus and a rich source of vitamin C and pectin. Guava is available at cheaper rate and is popularly known as “Poor man apple”. The vitamin ‘C’ content of the fresh ripe fruit varies from 100 to 260 mg per 100g of fruit pulp. Beside this, it is also a good source of vitamin A, vitamin B and minerals.

Guava can be propagated by air-layering, inarching, stooling, root cutting and budding. Air-layering is the most popular commercial method of vegetative propagation of guava in Bihar. The success and survival of the plants are poor. Air-layering was evaluated as a commercial method of vegetative propagation of guava (Albany *et al*., 2004). The success of air-layering depends on factors like varying conditions of climate, species and varieties of the plant and environmental factors like air, temperature, humidity and mechanical treatments. Physiological condition of mother plant, age of wood and season during which cutting are taken also affect the rooting of cuttings. Internal and structural factors like stored food material in the layer age, maturity of the tissues, etiolation and callusing. With the advancement of horticultural science, the technology of air-layering has also been improved.

MATERIALS AND METHODS

The present investigation was carried out during the year 2009-10 to study the economics of plant prepared through air-layering of guava. The experiment was conducted with twelve treatment replicated thrice in the monsoon season. The experiment was conducted in the Horticulture Garden of Bihar Agricultural College, Sabour (Bhagalpur). For the present investigation seven years old guava plant of uniform growth was selected as experimental plant. The plants were healthy, free from pests and diseases and were grown under similar agro-climatic condition. Similar cultural and manurial schedules were adopted. One or two years old shoots having the pencil thickness (i.e., approximately 0.8 to 1.0 cm) were selected for air-layering. Twenty shoots were selected for each treatment. The selected shoots, which have to be ringed, the 4-6 cm long shoot portion wrapped with a band of black polythene film. The etiolation was done before one month of layering. The excess water adhering to the roots was dried by means of a blotting paper. The numbers of rooted layers were counted after 70 days of layering. The percentage of rooted layers was computed in relation to total number of layers tied. Ultimate survival and mortality of air-layers in the nursery were recorded after 180 days of detachment and percentage of survival for each treatment was computed. Cost of production of layers under each treatment was calculated by evaluating the cost of growth regulators, sphagnum moss, polyethylene sheet, sutli, labour wages etc. Mortality and success of each treatment was evaluated and then the cost of production per air-layer under each treatment was obtained.

RESULTS

The results of different characters i.e. rooting characters in relation to the percentage of rooted air-layers were recorded at 70 days of layering. Establishment of air-layers in the nursery, survival percentage of air-layers were recorded after 180 days of detachment from the mother plants and finally the data were analysed and interpreted. Observations on rooting percentage of air-layers revealed that success in air-layering induced by all etiolation followed by application of growth regulators, varied from 54.33 to 94.66 per cent. The maximum rooting percentage was recorded in T_8 (94.66%) which was statistically at par with the treatments T_5 (91.33%) and T_7 (88.33%). Whereas, the minimum rooting percentage was found in T_1 (54.33%) followed by treatment T_2 which was statistically at par with T_4. Among all the treatments, etiolation followed by application of IBA @ 3000 ppm was found most effective, followed by etiolation with application of NAA @ 3000 ppm concentration. While, with growth regulators NAA @ 6000 ppm concentration showed minimum effect on the success of rooted layers (71.66%). The survival and mortality of air-layers in the nursery was recorded at 180 days after the detachment of layers from mother plants in respect of total number of layers prepared at the time of layering. The percentage of survival was recorded in Table-1. Etiolation followed by application of IBA @ 3000 ppm was found most effective in increasing the survival of air-layers. Etiolation followed by application of NAA @ 3000 ppm concentration recorded second; whereas IBA @ 6000 ppm concentration was obtained third position. It was observed that the number of new leaves per layer varied from 9.33 to 18.33 in different treatments.

Table 1: Economic Analysis of Trial (Net Income)

Treatments	Chemicals and Concentrations	Success (%)	Survival (%)	Net Income Rs/60 Air-Layers (Mean)	B:C Ratio Mean
T_1	Control	54.33	50.33	389.97	6.19
T_2	Etiolation	66.33	61.00	474.50	6.36
T_3	NAA @ 3000 ppm	78.33	64.75	517.95	7.99
T_4	NAA @ 6000 ppm	71.66	62.27	493.83	7.41
T_5	NAA @ 3000 ppm + Etiolation	91.33	75.90	607.01	7.95
T_6	IBA @ 3000 ppm	84.66	74.30	603.80	9.30

Table 1: Contd.,					
T_7	IBA @ 6000 ppm	88.33	71.42	575.98	8.62
T_8	IBA @ 3000 ppm + Etiolation	94.66	78.33	628.57	8.22
T_9	NAA @ 3000 ppm + IBA @ 3000 ppm	85.00	68.15	547.65	8.33
T_{10}	NAA @ 3000 ppm + IBA @ 6000 ppm	82.66	66.38	528.70	7.70
T_{11}	NAA @ 6000 ppm + IBA @ 3000 ppm	79.33	64.25	509.88	7.45
T_{12}	NAA @ 6000 ppm + IBA @ 6000 ppm	86.66	69.82	557.98	7.92
SEm±		2.78	1.82	20.88	0.28
C D at 5 %		8.17	5.35	61.12	0.83

Table 2: Economic Analysis of Trial

Treatments	No. of Plant Survive	Rate at Which Sold	Gross Income (Rs/60 Air-Layers)	Total Cost (Rs.)
T_1	30.20	15	452.97	63.00
T_2	36.60	15	549.00	74.50
T_3	38.85	15	582.75	64.80
T_4	37.36	15	560.43	66.60
T_5	45.54	15	683.31	76.30
T_6	44.58	15	668.70	64.90
T_7	42.85	15	642.78	66.80
T_8	46.99	15	704.97	76.40
T_9	40.89	15	613.35	65.70
T_{10}	39.82	15	597.30	68.60
T_{11}	38.55	15	578.28	68.40
T_{12}	41.89	15	628.38	70.40

Economics of Production of Air-Layers

The economics of propagation of sixty air-layers under different treatments and control were evaluated and the data for the Net Income and B:C ratio of guava air-layers are presented in Table-1 and 2. On critical examination of table it was promulgated that the maximum net income (Rs. 628.57) was obtained in T_8, which was statistically at par with T_5 (Rs. 607.01), T_6 (Rs.603.80) and T_7 (Rs.575.98). However, the minimum net income was obtained in control i.e., T_1 (Rs.389.97). Etiolation followed by application of IBA @ 3000 ppm concentration gave maximum net income followed by etiolation + application of NAA @ 3000 ppm was the second best.

It is evident from the data that the Benefit cost ratio (B:C ratio) for sixty air-layer under different treatments vary from 6.19 to 9.30. Maximum benefit cost ratio was calculated in T_6 (9.30) which was statistically at par with T_7 (8.62), whereas the minimum benefit cost ratio was calculated in T_1 (6.19) i.e., control.

Among all the treatment, etiolation followed by application of IBA @ 3000 ppm concentration indicated maximum net income but the benefit cost ratio was less because the price of growth regulators was more, as in other case it was performing better with etiolation.

Thus from the commercial point of view it can be concluded that for the economic production of guava air-layers, etiolation followed by application of IBA @ 3000 ppm may be practiced. However, etiolation followed by application of NAA @ 3000 ppm concentration can also be used for economical production of guava layers.

DISCUSSIONS

Guava is usually propagated by vegetative means and air-layering is the commercial practice among nurserymen. In layering, success depends on early root initiation and formation of sufficient fibrous roots. Etiolation stimulates the rooting at etiolated portion in the number of fruit plants. Recently growth regulators are being used to achieve more success in rooting. Among different growth regulators, auxins like IBA and NAA are found to be more effective. While using growth regulators, use of proper concentration is also important because excessive dose may cause yellowing and dropping of leaves, blackening of stem and eventually death of layers, while lower concentration may inhibit the growth. Etiolation of shoot cleaved before air-layering definitely have profound effect on rooting ability and root quality of air-layers. The etiolated region accumulated more sugar natural auxin and other rooting co-factors, which are known to increase adventitious root formation. Etiolation treatment of shoot further improved the regeneration capacity of layers. Etiolation may reduce the production of lignin, thus instead of forming lignin phenolic metabolites may be channeled to enhance root initiation. Different scientists observed that the application of root promoting substances (IBA, NAA and IAA etc) used in etiolated shoots gave higher percentage of success than non-etiolated shoots. Mukherjee and Bid (1965) revealed that etiolated shoots of mango treated with IBA @ 10,000 ppm and NAA @ 5000 ppm concentration induced 100 per cent rooting. Bid and Mukherjee (1969) reported that 100 per cent rooting was found in Langra mango with the concentration of 10,000 ppm of IBA or 5000 ppm of IBA+NAA in etiolated layered shoots. Chausa variety of mango gave 98.66 per cent rooting with etiolated shoots treated with IBA+NAA @ 5,000 ppm, whereas, in Bombay green variety complete success was found in etiolated shoots when treated with IBA @ 5,000 ppm.

Maximum benefit cost ratio (B/C ratio) was calculated in T_6 (9.30) which was statistically at par with T_7 (8.62). Whereas, the minimum benefit cost ratio was calculated in T_1 (6.19) i.e., control. These results gained on economic aspects are also in conformity with the results of Luhach *et al* (2007); Luhach *et al*. (2007); chand et al., (2008); and Mandal (2008).

CONCLUSIONS

Economics of production of guava air-layers reveals that the net income was computed higher (Rs.628.57) in T_8 (etiolation + IBA @ 3000 ppm) and minimum in control (Rs.389.97) because of better survival, the net income per air-layer was computed maximum in treatment T_8 (etiolation + IBA @ 3000 ppm). The benefit cost ratio (B:C ratio) was recorded highest in T_6 (IBA @ 3000 ppm) 9.30 which was statistically at par with T_7 (IBA @ 6000 ppm) 8.62. Because the cost of production per air-layers was computed less, as the treatment has been given without etiolation. The minimum B:C ratio was computed in T_1 (Control) i.e., 6.19.

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REFERENCES

1. *Bid, N. N. and S. K. Mukherjee (1969). Varietal response of etiolation and growth regulator treatment in air-layering of mango (Mangifera indica L.) Indian J. Agri. Sci., 39: 1013-1019.*
2. *Chand R, S. S Raja and Pandey, L. M (2008) Progress and potential of horticulture in India. Indian J. Agric. Econ.* ***63*** *(3): 299-309.*

3. *Hayes, W. B. (1957). The guava and its relative. Fruit growing in India. 286-303, Kitabistan, Allahabad.*
4. *Luhach, V. P., R. K. Khatkar, A. Godara and S. K. Mehta (2007). Cost of cultivation of mango orchard. Haryana J. Hort. Sci., 36 (3 & 4): 266-267.*
5. *Luhach, V. P., R. K. Khatkar, A. Godara and S. K. Mehta (2007). Economics of guava cultivation. Haryana J. Hort. Sci., (3 & 4): 268-269.*
6. *Mandal, R. C. (2008) Problems and prospect of mango cultivation in W.B a study of Malda district. Indian J. Agric. Econ. 63 (3): 366-367.*
7. *Mukherjee, S. N. and M. N. Bid (1965). Propagation of mango (Psidium guajava L.) II. Effect of etiolation and growth regulator treatment on success of air-layering. Ind. J. of Americ. Sci.* ***35*** *(4): 309-315.*